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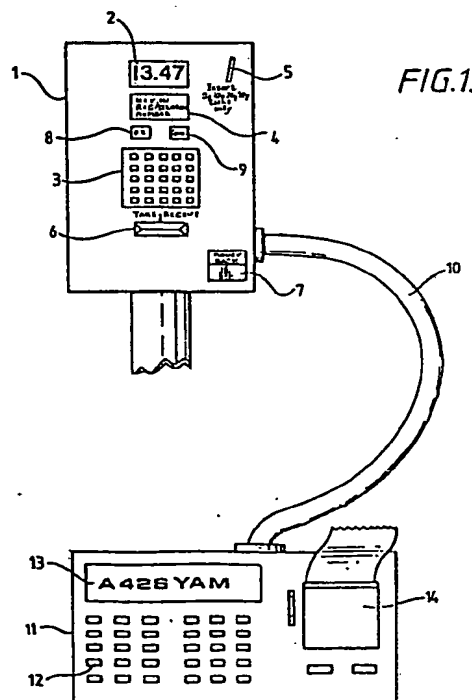
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54 Electronic time metering device.

57 Electronic parking apparatus includes a time metering device into which information unique to a vehicle to be parked (e.g. a vehicle's licence plate number) can be entered via, for example, an alpha-numeric keyboard. The entered information is encoded and stored in machine readable form in a memory store in conjunction with data related to the time at which the unique information was entered. An electronic device is provided which is capable of interrogating the memory store by reference to the entered information unique to a particular vehicle to access the time-related data stored in memory in conjunction with the unique information appertaining to that vehicle. Thus, for example, parking fees can be calculated.



### Electronic Time Metering Device

This invention relates to electronic parking apparatus and, more especially, to electronic time metering devices for use with vehicle parking systems.

Parking systems are known in which a motorist  
5 purchases parking time from a payment machine located  
within a vehicle park and displays on the respective  
vehicle a ticket which gives an indication of the date  
and time of purchase and the amount of time which the  
motorist has elected to purchase or, alternatively,  
10 the date and time up to which payment has been made.

The validity and authenticity of the tickets displayed are checked by a roving attendant authorised to issue excess payment vouchers for out-of-time or illegal parking. Such systems are known generally as

5 "Pay and Display" parking systems.

Advantages of such systems include the fact that a motorist is not delayed on entry to and exit from the vehicle park; the labour and capital costs required to install, operate and service a "Pay and

10 Display" system are less than with other parking systems; and motorists frequently purchase longer periods of time than they actually use in the vehicle park.

"Pay and Display" systems suffer, however, from

15 a number of disadvantages. These include the necessity for a motorist to return to his or her vehicle after purchasing a parking ticket in order to display the ticket on the respective vehicle. Thus, a motorist is required to make a double trip

20 between the payment machine and the vehicle. In addition, tickets are frequently displayed on or adjacent to a dirty windscreen, making inspection of the ticket details difficult; such difficulties also arise where a vehicle is parked with its front end

25 adjacent a wall or other obstruction. Further, the cost involved in producing self adhesive tickets and printing easily read characters onto the tickets is

considerable; also, discarded tickets and adhesive strip covers are a major source of litter. In addition, motorists frequently pass on tickets which have only partly expired to other motorists thereby  
5 reducing the income for the vehicle park owner. Finally, a conventional "pay and display" system cannot properly be used for motor cycles or open vehicles since the tickets can easily be stolen.

Another well known parking system is one in which  
10 a ticker is issued by a machine as a motorist approaches an entry barrier of a vehicle park; the motorist then submits the ticket to an attendant before or on leaving the vehicle park and pays a parking fee based on the time spent in the vehicle  
15 park. A vehicle control device such as a raisable barrier is usually provided to prevent motorists leaving the vehicle park without paying.

Various methods of coding the ticket with the time of entry are used, for example time stamping,  
20 magnetic encoding, punched holes and bar codes.

Whilst all these methods enable the correct fee to be determined, the information used in the computation is in every case taken from the ticket and is entirely disassociated from the vehicle using the  
25 park. This shortcoming has resulted in a simple fraud being perpetrated, particularly in airport and city centre car parks, where daily fees are high.

Briefly the fraud is worked as follows:

A motorist leaves his vehicle in the park for several days running up a very high charge. When he wishes to collect his car he arranges for an  
5 accomplice to drive into the park thereby obtaining a ticket which is then given to the long term parker who drives to the exit paying the minimum fee. The accomplice then follows claiming to have lost his ticket. A list of the registration numbers of  
10 vehicles parked overnight is normally kept and when this is checked the registration number is not found, in which case the full daily charge only is made. The net loss to the operator can be considerable.

The use of parking meters for controlling street  
15 parking is, of course, well established. Major disadvantages of such a parking system include the high cost of producing, erecting and maintaining the parking meters; the cost of collecting and securing parking fees from a large number of such meters; the  
20 need to provide a bay adjacent such a meter of a length sufficient to enable the largest rather than the average likely vehicle to park; the loss of revenue due to motorists using up time purchased by the previous occupant of the parking bay;  
25 the hazard which such meters present to the blind and partially sighted; and the negative aesthetic appeal

of a multiplicity of meters displayed along the  
kerbside of a street or road.

The present invention is applicable to all three  
of the parking systems described above and sets out to  
5 retain the advantages present in such systems whilst  
overcoming many of the disadvantages.

According to the present invention in one aspect,  
these is provided electronic parking apparatus  
including means operable to receive and record  
10 information unique to a vehicle to be parked and to  
encode and store this information in machine readable  
form in a memory store in conjunction with data  
related to the time at which said unique information  
is recorded, and means operable electronically to  
15 interrogate said memory store by entering information  
unique to a particular vehicle to access the time-  
related data stored in memory in conjunction with the  
unique information appertaining to that vehicle.

Preferably the unique information recorded is the  
20 number appearing on the vehicle's licence plate.  
Alternatively, the unique information recorded  
comprises an electronically read identification  
carried by a vehicle to be parked.

The information receiving and recording means may  
25 be located at one or more entrances to a vehicle park  
and the interrogation means may be located at one or  
more controlled exits from said vehicle park. The

vehicle licence plate numbers may be recorded by a video camera operable to transmit encoded information representative of such numbers to the memory store.

Alternatively vehicle licence plate numbers may  
5 be entered by means of an electronic alpha-numeric keyboard operable to transmit encoded information representative of such licence plate numbers to the memory store.

The means operable to receive and record  
10 information unique to a vehicle may comprise a time metering payment machine including an alpha-numeric keyboard by which information unique to a vehicle to be parked can be entered and payment means by which parking time can be purchased. The time-related data  
15 held in memory in conjunction with the unique information may be the time at which the parking time purchased expires or the time at which such information is entered.

The time metering payment machine may further comprise  
20 an electronically programmable display operable to display the entered unique information and/or information related to the parking time purchased.

In one arrangement the interrogation means  
25 comprises a separable electronic unit including an alpha-numeric keyboard by which information unique to a particular parked vehicle can be entered and stored in memory in the interrogation unit. In this

arrangement, means are provided for linking electronically the interrogation unit and the payment machine to cause the memory stores of the payment machine and the interrogation unit to communicate one  
5 with the other.

According to the present invention in a further aspect, there is provided electronic time metering apparatus for a vehicle park from which vehicles leave through one or more controlled exits, the apparatus  
10 including means located at one or more entrances to the vehicle park for recording information unique to a vehicle to be parked and for passing this unique information to a memory store where it is retained in machine readable form in conjunction with information  
15 related of the time of entry of a vehicle to the vehicle park, and electronic means for interrogating the memory store by entering the said unique information of a vehicle leaving the vehicle park through a controlled exit to determine the time  
20 interval between the original unique information being recorded and the memory store being interrogated.

According to the present invention in a still further aspect there is provided electronic time metering apparatus for vehicle parking zones having  
25 unrestricted means of entry and exit, said apparatus comprising an electronic time metering machine including means by which information unique to a



vehicle to be parked can be entered, a memory store operable to receive and store in machine readable form said unique information in conjunction with information related to the time at which said information is entered, an electronic interrogation machine into which said unique information of vehicles parked can be entered and stored in memory in machine readable form, and means for linking said time metering and interrogation machines such that the memories can communicate one with the other to compare the stored information.

The invention will now be described by way of example only with reference to the accompanying diagrammatic drawings, in which :-

Figure 1 is a front view of a time metering device and interrogation device constructed in accordance with the invention;

Figure 2 is a block diagram of the electronic circuitry of the devices illustrated in Figure 1; and

Figure 3 illustrates alternative apparatus in accordance with the invention.

The time metering payment machine 1 illustrated in Figure 1 is designed especially for use in a "Pay and Display" type of parking system and includes a clock display 2, an alpha-numeric keyboard 3, an electronically programmable display 4 and a coin or token receiving slot 5. The coin receiving slot 5 is

connected to a receptacle (not shown) located securely within the meter casing.

The payment machine 1 also includes a slot 6 through which printed payment receipts are issued, an  
5 aperture 7 through which money can be returned to a user of the machine and buttons 8, 9 by which a user can respectively confirm that a correct entry has been made or alternatively cancel such an entry.

Shown connected to the time metering payment  
10 machine 1 through a suitable cable 10 is a portable interrogation unit 11 which includes an alpha-numeric keyboard 12, and electronically programmable display 13, a ticket printing and issuing device 14 and an electronic interface which enables the memory stores  
15 of the portable unit 11 and the payment machine 1 to communicate with one another. Other means of electronically linking the machines may be provided. Such means include light, radiowave and electrical connections.

20 The electronic circuitry of the machine 1 and unit 11 is illustrated in block form in Figure 2. Typically, coins or tokens admitted to the payment machine 1 are checked by an authentication unit 15 positioned in proximity to the slot 5; the unit 15  
25 verifies physically and/or electronically the genuineness and value of admitted coins or tokens and transmits an electronic signal to a value accumulator

16 indicative of the value of a coin or token admitted.

The output of the value accumulator 16 is processed by a central processing unit (CPU) 17 and either increments the clock 2 to the time up to which payment has been made (in which case the user presses a button on the payment machine or takes similar action to indicate that payment has been completed) or compares time paid-for against time preselected by the user, completing the transaction when the correct sum has been paid.

In either case the CPU 17 transfers data to a memory 18 at the point of completion of a transaction and activates a receipt printer 19 to cause an appropriate receipt to issue through slot 6.

A receipt issued through slot 6 merely provides a receipt for the time purchased and is not for display purposes in a parked vehicle.

Data entered via the alpha-numeric keyboard 3 is encoded and transmitted to the CPU where it is linked to data related to the time at which a correct entry has been made, that is to say, in the embodiment illustrated, the time up to which payment has been made; the conjoined data is then transferred to the memory 18.

Data entered by an operator of the keyboard 3 is initially displayed on the electronic programmable display 4 and is only transferred to the CPU 17 upon

the operator confirming that the entered information is correct by pressing button 8. If the display 4 shows that incorrect information has been entered, the entry can be deleted by pressing button 9 and the correct information entered. Data entered via the keyboard is information unique to a parked vehicle and conveniently consists of the registration number of the vehicle.

The unit 11 is operated by a roving vehicle park attendant who enters via the keyboard 12 the registration numbers of parked vehicles, the information being retained in machine readable code within the memory of the unit.

In operation, after parking his or her vehicle, a motorist walks to one of several payment machines 1, located, for example, at pedestrian exits from a vehicle park or a floor of a vehicle park, and operates the keyboard 3 to enter the relevant vehicle registration number. The keyed registration number is displayed on the display 4 and, if correct, is entered by depression of the button 8.

If incorrect, the entry deletion button 9 is pressed and the registration number re-entered. Once satisfied that the correct entry has been made, the motorist inserts money to the value of parking time required. The machine will then issue a receipt through slot 6 on which is printed either the latest

departure time or the arrival time of the vehicle together with the date and the registration number as entered on the keyboard and the amount paid. The machine retains in its memory in machine readable form  
5 the departure time in association with the entered registration number. The receipt is issued merely as a positive check should a dispute arise and does not constitute an essential component of the system.

For control purposes, a patrolling parking  
10 attendant walks through the vehicle park and enters into the portable unit 11, via the keyboard 12; the registration numbers of all or a selection of the vehicles present in the vehicle park at any given time. The attendant then connects his portable unit  
15 11 to an appropriate time metering payment machine 1 and activates the electronic link between the two machines.

The machines communicate information on the registration numbers entered into the portable unit 11  
20 and eliminate those which are entered in the memory of the time metering payment machine 1 and for which payment has not expired when the communication is made. When all the appropriate time metering payment machines have been interrogated, the display 13 on the  
25 portable unit 11 will show the registration numbers remaining in memory, together with the time they should have departed. Registration numbers of any

vehicles for which no entry has been recorded in the memory of the time metering payment machine are also displayed. Alternatively or additionally, this information may be displayed on the time metering payment machine or printed out by means of the receipt printer.

In an alternative embodiment the memory store 18 is situated remote from the payment machine 1 in, for example, a central store, or in one machine only, known as the master machine. In this case it is only necessary to connect the portable unit to one payment machine regardless of how many there are in the vehicle park.

As each registration number is displayed the attendant completes a penalty notice; alternatively, in a preferred version of the portable unit 11 illustrated, the printer 14 prints the appropriate details from the information stored in the unit either onto ticket sets stored in the machine or fed individually in at the time.

In an alternative embodiment of the invention to that illustrated, the portable unit 11 is replaced by one of more fixed interrogation units in permanent communication with the time metering payment machines. In this alternative embodiment, individual areas of the vehicle park may be scanned by means of a closed circuit television or the like so that the parking

attendant can input vehicle registration numbers into the fixed terminal. As above, any registration numbers of vehicles for which current payment is not made are identified and communicated to the attendant  
5 to enable a penalty or excess charge notice to be issued automatically or manually. One advantage of this alternative embodiment is that it provides, in addition, continuous surveillance of the vehicle park.

If required, a time delay may be provided between  
10 vehicle registration numbers being identified as unpaid and printing of penalty or excess charge notices in order to allow motorists to move from their vehicle to a payment point.

A further feature which can be included is a  
15 means for motorists to pay their excess charge through the machine.

One means of doing so can be illustrated as follows:-

The motorist returns to the machine from which he  
20 purchased his parking time and depresses one or more keys to denote his wish to pay an excess charge; he then keys in his registration number as for a normal transaction. The CPU 17 checks the payment status and indicates the excess charge due. This is paid into  
25 the machine and a receipt is issued, printed with details of the excess charge and the registration number. The motorist can then either send the

receipt together with the excess charge notice to the appropriate address or place them into a locked box or a slot in the machine where they will await collection.

5           A further feature which may be included provides regular users of a vehicle park with a preferential rate and/or a more convenient way of making payment.

          In one arrangement, each such user is issued with a card or token on which is encoded in machine  
10   readable code the registration number of the authorised vehicle, and the expiry date of the card or token.

          After having parked the authorised vehicle, the motorist inserts his or her card into the payment  
15   machine. The machine then checks that the card is valid and either proceeds to enter the registration number from the card into memory together with the maximum time period valid for that card, or alternatively invokes a special tariff scale  
20   appropriate to card holders and then, when payment has been made, automatically enters the registration number from the card into memory.

          In an alternative arrangement, the card is given a cash value in addition to the registration number  
25   and the payment machine decrements the cash value as appropriate to the parking period purchased.

Whereas the invention has been described above



with specific reference to a "Pay and Display" parking system, it is applicable also to alternative parking systems.

One such alternative parking system is one in which a ticket issuing machine is located at the or each entrance to a vehicle park. Conventionally, a vehicle control device such as a raisable barrier is positioned at the or each exit from and/or entrance to the vehicle park. In accordance with the embodiment of the present invention illustrated in Figure 3, a ticket dispensing machine 20 complete with an alpha-numeric keyboard 21 is located at each entrance and a motorist wishing to use the vehicle park keys in his vehicle registration number through the alpha-numeric keyboard 21 and confirms a correct entry by depressing an appropriate key in the manner described above. A printed ticket is then issued which carries the date, time of entry and the vehicle registration number and a barrier 22 rises to allow entry to the park.

In an alternative arrangement, the registration numbers of vehicles approaching an entrance to a vehicle park are viewed by a video camera and image processor operable to transmit encoded information representative of such registration numbers to a memory store. The camera may be positioned to read the front and/or rear number plate of a vehicle. Some means of manually recording registration numbers may

also be provided in the event that the camera is unable to do so, i.e. in the case of dirty or broken number plates.

5       The vehicle registration number so entered is communicated to a memory store within a computer 23 where it is held in association with the time and date of issue.

10       On a vehicle approaching an exit from the vehicle park, an attendant observes the registration number (this may be aided by mirrors or closed circuit TV including cameras 24 and monitors 25) and keys it into his terminal. The fee will then be computed within the computer 23 and displayed to the attendant (and possibly also to the motorist). Once payment is made, 15 a vehicle control barrier 26 is raised and the vehicle allowed to leave.

20       Recordal of the registration number of a vehicle leaving the vehicle park may be effected by means of a video camera and image processor in the manner described above.

25       In one alternative version of the system, an attendant observes vehicles approaching the entry and enters the registration number into a computer terminal. The number is communicated to the computer's memory store and to the ticket dispenser which then dispenses the ticket printed with time and date of entry and registration number. The terminal

may be the same as that used for exit or be separate therefrom.

The payment point may be remote from the exit in which case the system may incorporate an allowable  
5 time lapse between payment and departure. As the vehicle is observed approaching the exit the attendant keys in the registration number and the computer indicates whether payment had been made and whether  
the time lapse had been exceeded.

10 Alternatively, an automatic visual identification system is incorporated at entry to and/or exit from the vehicle park to read the registration number of the vehicle and automatically enter it into the system.

15 Unique information other than a vehicle registration number may be used. Thus, vehicles may be fitted with an electronic identification system which transmits a unique code from the vehicle to a static receiver which in turn enters this code into  
20 the parking control system.

Furthermore, payment may be made other than by way of coins. Thus, the payment machines may be programmed to accept suitably encoded cards, season tickets or discs. In all other ways, such machines  
25 include the same features and operate in the same manner as described above.

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The present invention also has application to the control of street parking. In this embodiment, one or more payment machines 1 in accordance with the invention are located, for  
5 example, one at each end of a parking zone or street. As in the case of the aforementioned "Pay and Display" system, a motorist wishing to park a vehicle enters the vehicle's registration number via the alpha-numeric keyboard of the machine and purchases the  
10 required parking time. A patrolling parking control officer subsequently enters the registration numbers of parked vehicles in a portable machine and interrogates the memory store of the individual payment machines to identify those vehicles for which  
15 no payment has been made or for which the purchased parking time has expired.

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CLAIMS

1. Electronic parking apparatus including means operable to receive and record information unique to a vehicle to be parked and to encode and store this information in machine readable form in a memory store  
5 in conjunction with data related to the time at which said unique information is recorded, and means operable electronically to interrogate said memory store by entering information unique to a particular vehicle to access the time-related data  
10 stored in memory in conjunction with the unique information appertaining to that vehicle.

2. Apparatus as claimed in Claim 1 wherein the unique information recorded is the number appearing on a vehicle's licence plate.

15 3. Apparatus as claimed in Claim 1 wherein the unique information recorded comprises an electronically read identification carried by a vehicle to be parked.

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4. Apparatus as claimed in any one of Claims 1 to 3 wherein information receiving and recording means is located at one or more entrances to a vehicle park and the interrogation means is located at one or more controlled exits from said vehicle park.
5. Apparatus as claimed in any one of Claims 2 to 4 wherein vehicle licence plate numbers are recorded by a video camera operable to transmit encoded information representative of such numbers to the memory store.
6. Apparatus as claimed in any one of Claims 2 to 4 wherein vehicle licence plate numbers are entered by means of an electronic alpha-numeric keyboard operable to transmit encoded information representative of such licence plate numbers to the memory store.
7. Apparatus as claimed in any one of Claims 1 to 6 wherein the time-related data is the time at which the unique information is entered into the memory store.
8. Apparatus as claimed in any one of Claims 1 to 6 wherein the means operable to receive and record information unique to a vehicle comprises a time metering payment machine including an alpha-numeric keyboard by which information unique to a vehicle to

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be parked can be entered and payment means by which  
parking time can be purchased, and wherein the time-  
related data held in memory in conjunction with the  
unique information is the time at which the parking

5 time purchased expires.

9. Apparatus as claimed in Claim 8 wherein the time  
metering payment machine further comprises an  
electronically programmable display operable to  
display the entered unique information and/or  
10 information related to the parking time purchased.

10. Apparatus as claimed in Claim 8 or Claim 9  
wherein the interrogation means comprises a separable  
electronic unit including an alpha-numeric keyboard by  
which information unique to a particular parked  
15 vehicle can be entered and stored in memory in the  
interrogation unit, and means for linking  
electronically the interrogation unit and the payment  
machine to cause the memory stores of the payment  
machine and the interrogation unit to communicate one  
20 with the other.

11. Electronic time metering apparatus for a vehicle  
park from which vehicles leave through one or more  
controlled exits, the apparatus including means  
located at one or more entrances to the vehicle park

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for recording information unique to a vehicle to be  
parked and for passing this unique information to a  
memory store where it is retained in machine readable  
form in conjunction with information related of the  
5 time of entry of a vehicle to the vehicle park, and  
electronic means for interrogating the memory store by  
entering the said unique information of a vehicle  
leaving the vehicle park through a controlled exit to  
determine the time interval between the original  
10 unique information being recorded and the memory store  
being interrogated.

12. Electronic time metering apparatus for vehicle  
parking zones having unrestricted means of entry and  
exit, said apparatus comprising an electronic time  
15 metering machine including means by which information  
unique to a vehicle to be parked can be entered, a  
memory store operable to receive and store in machine  
readable form said unique information in conjunction  
with information related to the time at which said  
20 information is entered, an electronic interrogation  
machine into which said unique information of vehicles  
parked can be entered and stored in memory in machine  
readable form, and means for linking said time  
metering and interrogation machines such that the  
25 memories can communicate one with the other to compare  
the stored information.



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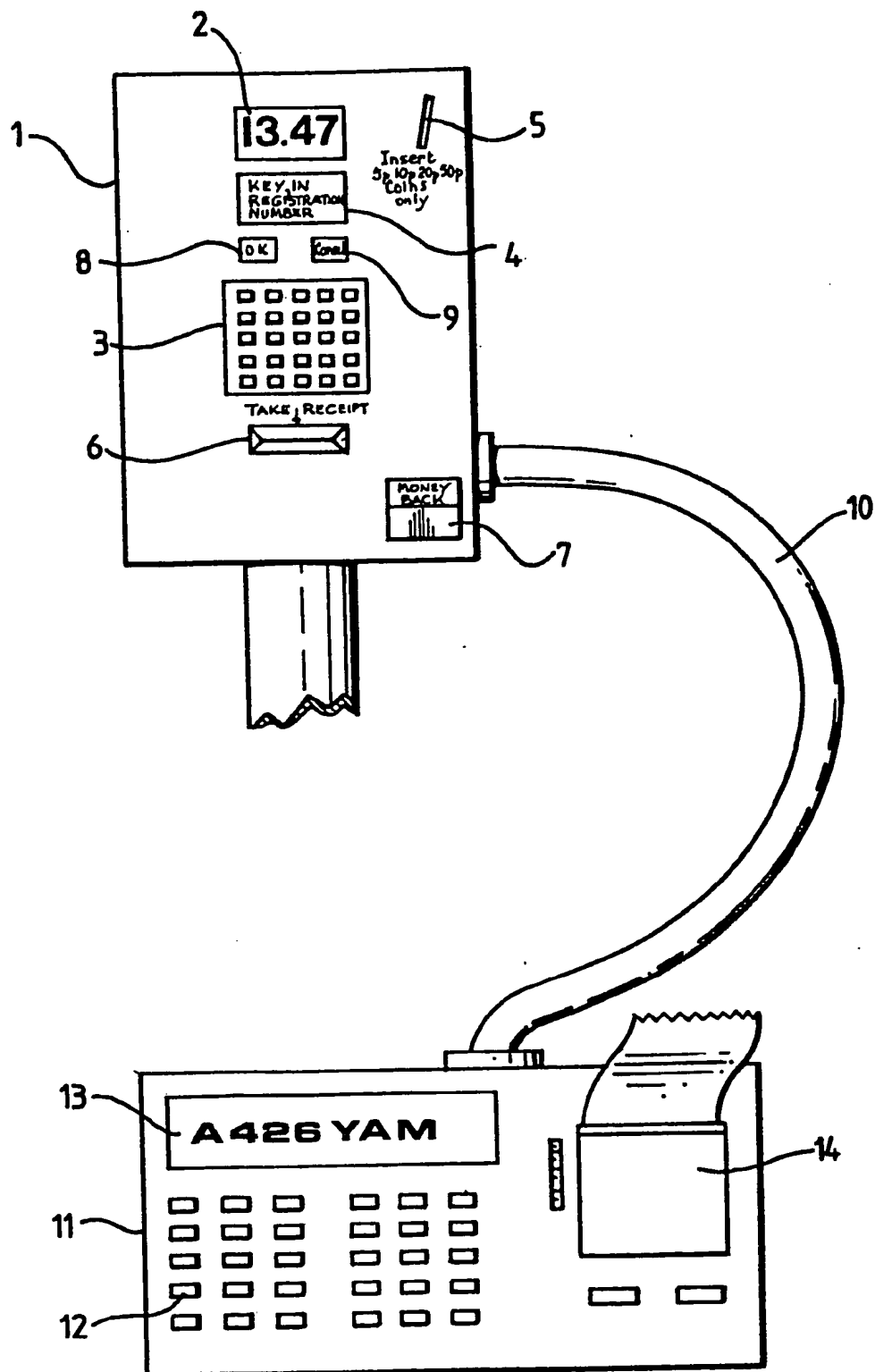


FIG. 1.

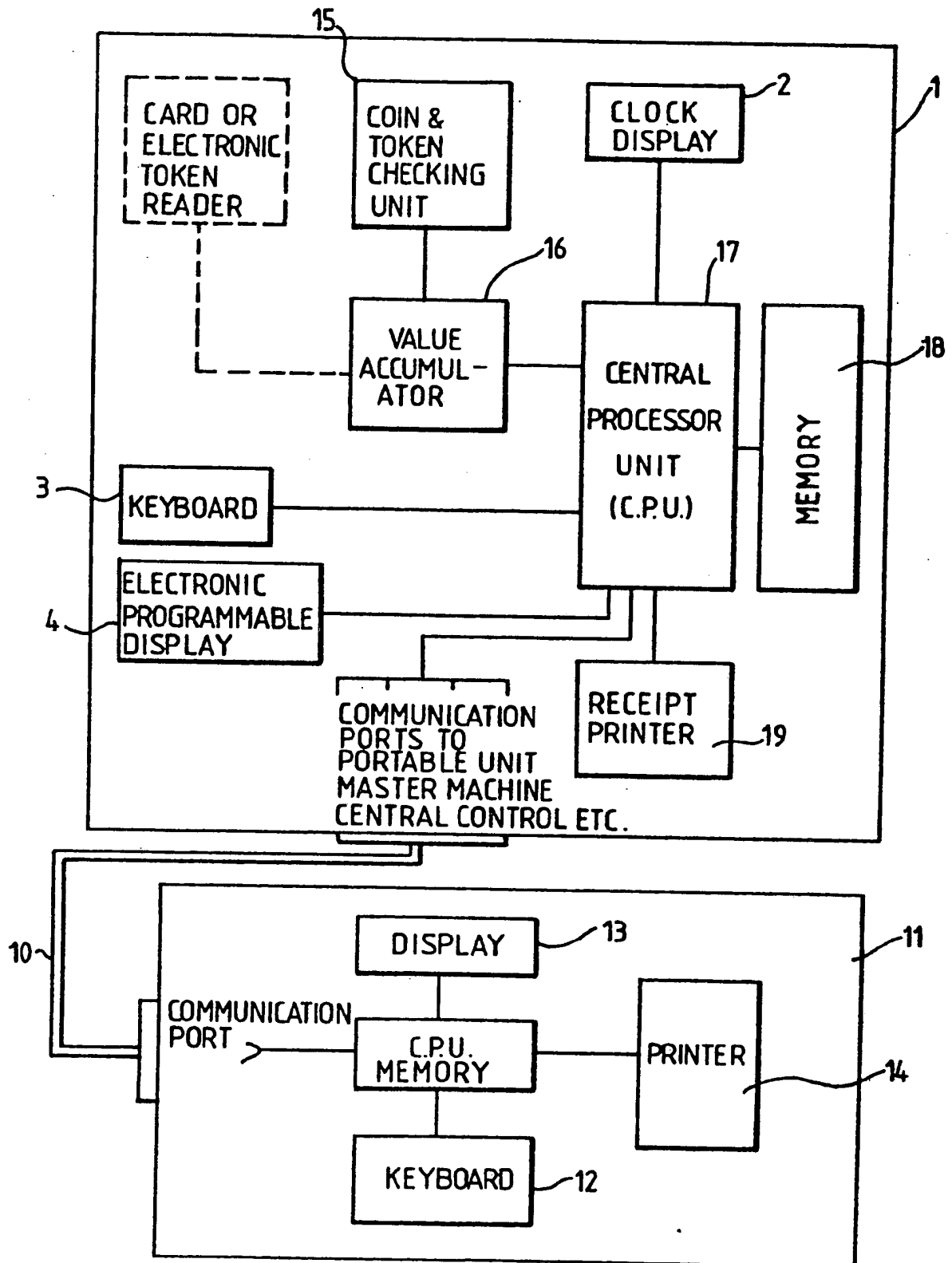
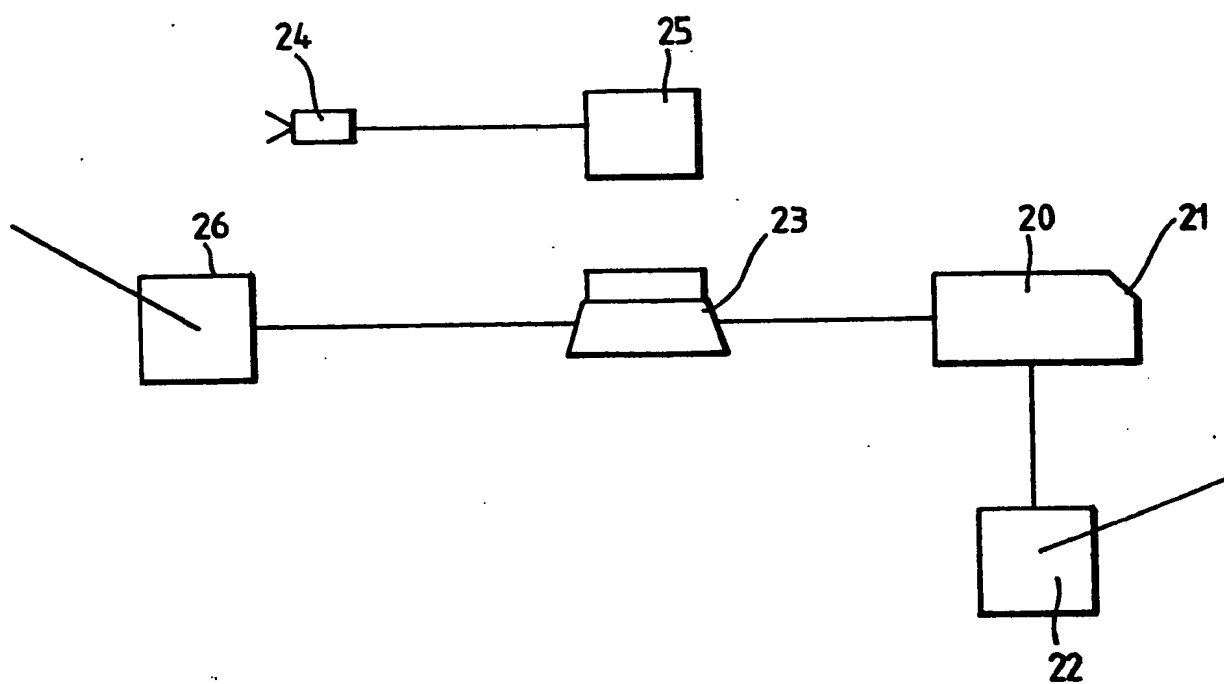


FIG.2.

*FIG.3.*

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